A Survey of the Littoral Marine Mollusks of the Caribbean Coast of Costa Rica

BY

JOSEPH RICHARD HOUBRICK

Division of Science and Mathematics, St. Leo College, St. Leo, Florida 33574

(1 Text figure; 1 Map)

INTRODUCTION

THE COMPOSITION OF the marine molluscan fauna of the western Caribbean is relatively unknown. For a period of six weeks the writer was able to study and collect marine mollusks in two different areas of Limón Province, Costa Rica. The purpose of this work and of the research that followed was to investigate the composition and range of the fauna in order to compile a list of the Recent species, to observe their ecological distribution, and to provide some basis for future study in this little-known section of the Caribbean region.

Although the period was barely sufficient to allow for an exhaustive survey of the mollusks and the entire range of the variety of their habitats, a good portion of the littoral or shallow water fauna is believed to be recorded. However, more complete and sophisticated collecting methods in these areas would undoubtedly extend the list of existing species and provide further pertinent information.

The marine mollusks of the Caribbean coast of Costa Rica have received little or no attention from recent workers. Indeed, the whole of the Caribbean coast of Central America has not received adequate scientific investigation and is poorly known in relation to other areas of the Caribbean Province.

With the prospect of a future sea-level canal being constructed somewhere in the Central American isthmus an investigation of the marine fauna of both the Caribbean and Pacific sides is desirable. A sea-level canal would make possible a limited mixing of the Caribbean and Panamic faunas for the first time since the late Miocene.

The area near Puerto Limón presented the most favorable base for living, transportation facilities, and collecting. Consequently, the major portion of this paper deals with the marine mollusks from this vicinity.

ACKNOWLEDGMENTS

It is a pleasure to acknowledge at this time Dr. Donald R. Moore of the Institute of Marine Science, University of Miami, whose help, interest and suggestions throughout this project have been invaluable. I am also indebted to Drs. William Clench and Kenneth Boss who kindly read the manuscript and offered suggestions. Gratitude is also due to Dr. Axel A. Olsson and Mr. Ted LaRoe who assisted in the identification of some of the fauna. Finally, I am indebted to the Organization for Tropical Studies for the opportunity to collect in some of the areas of Costa Rica and to St. Leo College for both financing the field work and providing leave time for the research involved.

PREVIOUS WORK ON WESTERN CARIBBEAN MOLLUSKS

The literature dealing with the marine mollusks of the Caribbean coast of Central America is rather sparse. This important portion of the Caribbean Province is perhaps the most poorly known by way of actual collection and study. OLSSON & MCGINTY (1958) believed that the principal reason is the scarcity of convenient collecting stations along the Caribbean coast as compared to the abundance and ready accessibility of such grounds on the Pacific side.

The earliest literature on the Recent fauna deals with the mosquito coast of Nicaragua and consists of several short articles and notes published by FLUCK (1900 - 1901; 1905). The next reference to the area occurs in 1958 with the work of OLSSON & MCGINTY in Panama. This seems to be the only substantial report we have about this area. The paper consists of a faunal list along with the description of some new genera and species. Recently,

Bakus (1968) has published a comparative study of littoral zonation of the gastropods on the Pacific and Atlantic coasts of Costa Rica in which a brief account of the Limón area is given with a list of the mollusks collected at Portete. With the exception of the above paper and the distributional records listed in Johnsonia, nothing more seems to be recorded of the marine mollusks of the Caribbean coast of Costa Rica.

Two publications dealing with the southwestern Caribbean fauna are those by **Coomans** (1958) and **Rehder** (1962), the former on the gastropods of the Netherlands Antilles and the latter on the Los Roques mollusca.

The fossil mollusca of the western Caribbean have received more attention by workers. **Gabb** (1881) and **Olsson** (1922) have reported on the Pliocene and Miocene molluscan faunas of eastern Costa Rica. **Woodring** (1957) has investigated the Canal Zone and **Weisbord** (1961; 1964) discussed the late Cenozoic mollusca of northern Venezuela and provided an excellent bibliography of the Caribbean fauna.

In conclusion, a survey of the literature reveals that knowledge of the Recent western Caribbean fauna is surprisingly incomplete and spotty. Further research is needed to gain a full picture of this sector of the Caribbean Province.

REGIONAL GEOGRAPHY AND GEOLOGY

The Caribbean slope of Costa Rica is composed of Cenozoic strata which dip away from the central mountains to the sea. The eastern coastline is slightly concave, lacking large bays or inlets. The Atlantic coastal plane occupies nearly one-third of Costa Rica and is almost flat. Offshore, the narrow shelf which is rarely more than 10 miles wide, slopes to a depth of 600 feet.

The climate of this region is tropical with a heavy rainfall. Most of the northern coast of the province of Limón is low and covered with dense forest interlaced with rivers, creeks, brackish estuaries, and swampy areas of *Raffia* palms. The beaches are broad and of a gray volcanic sand. An excellent description of this coastline is given by **Carr** (1956).

According to **Olsson** (1922), there was a complete inter-oceanic connection in this region during the lower Miocene, and nearly all of the Costa Rican isthmus was then beneath the sea. At the close of this epoch, eastern Costa Rica was again emergent for a short period. During the upper Miocene the whole of Costa Rica as well as Panama were in an uplifting process. This elevation destroyed the inter-oceanic connections and culminated in the early Pliocene. Thus, during the whole of the Tertiary, Costa Rica underwent great changes due to periods of submergence and uplift of its land masses.

In contrast to the northern coastline, the central Limón peninsula is of a coralline limestone formation. **Olsson** (1922) and **Schuchert** (1935) both believed that this outcrop belongs to the Gatun formation. This area is very rich in fossiliferous marls, and **Gabb** (1881; 1881 a) described about 70 species of fossil mollusks from the Limón area. **Olsson** (*op. cit.*) described 334 species from the Gatun formation.

FAUNAL ORIGINS AND RELATIONSHIPS

The warm tropical waters of the western Caribbean support a molluscan fauna similar to that of the West Indies and the Florida Keys, and are a portion of the zoogeographical area known as the Caribbean Province. **Warmke & Abbott** (1961) presented a map showing the extent of this province. Conditions are fairly uniform, allowing many species to exist throughout the province, and the molluscan fauna is impressive. **Abbott** (1962) remarked that the larger West Indian islands have over 1200 species of marine mollusks, while the smaller isolated coral islands, poor in food, have only about 350 kinds of mollusks. **Moore** (personal communication) found a depauperate fauna in the Albuquerque Cays off Nicaragua. **Olsson & McGinty** (1958) recorded about 543 species and subspecies from the Panama coast. We report 250 species herein from Costa Rica. The lower numbers of species from the western Caribbean may indicate a poorer fauna or reflect the inadequate work done in this region.

Many species of the Caribbean Province have close affinities to those of the Panamic Province. C. B. **Adams** (1852) was the first to point out the similarities and to draw up a list of analogous species between the two provinces. **Dall** (1912), in his study of the fossil shells from eastern Panama and Costa Rica, noted that these mollusks were mostly of common Caribbean living forms, but found an interesting admixture of species now living on the Pacific coast. Later, **Schuchert** (1935) remarked that the Miocene shell faunas of Central America were ancestral to the living ones of the Caribbean and to some in the Pacific. **Olsson** (1922) stated that "... thirteen percent of the Gatun fauna is identical or closely related to the recent species the majority of which are found living along the Caribbean coast, certain others only on the Pacific side, and a few common to both." He found 6 species to be specifically identical with forms in the Pacific and 18 others that showed close relationships.

There were probably two natural seaways crossing Central America during the Miocene, the main one across Costa Rica and a second through the Darien of Panama. This permitted free circulation of water between Atlantic and Pacific oceans and it was in these warm seas that the Miocene faunas developed which were ancestral in part to the bulk of modern Caribbean and Panamic faunas. Keen (1958) observed that the sizeable number of parallel or analogous species on either side testify both to the slowness of change in the isolated stocks and to their past relationships. Olsson & McGinty (1958) and Olsson (1961) pointed out that the fauna has remained little modified in the Pacific section while the Caribbean has undergone a greater change through a major extinction of many of the older Miocene groups due to the drainage of large tracts of its shallower parts during mid-Pleistocene glaciation in the northern hemisphere. Other groups later invaded this area from the north and east, and present day Caribbean mollusks, when compared to the rich Miocene fauna, appear to be impoverished.

COLLECTING LOCALITIES

The two areas discussed in this paper are located in the province of Limón, Costa Rica. A map of the area is given in Figure 1. The station most thoroughly worked was that of Portete, a small fishing settlement on the shores of a lagoon located a few miles to the north of Puerto Limón. This is in the central portion of Costa Rica's Caribbean coastline, more precisely at Lat. 10°N, Long. 83°02′W. The whole area consists of a projection of the land into the Caribbean, the coastline being of a coralline limestone formation and somewhat elevated. It is surrounded by moist tropical forest with a network

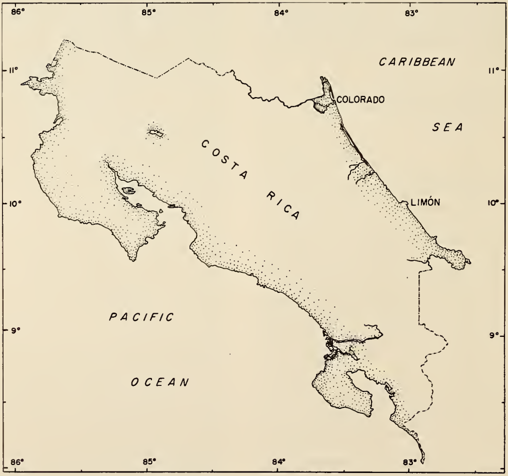

Figure 1

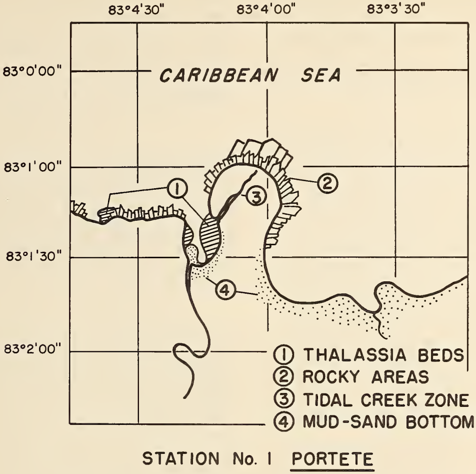

Figure 2

of brackish water lagoons and *Raffia* palm swamps.

Collections and observations at Portete were made during the dry season in March of 1965 for a period of 3 days. The same station was more thoroughly collected for a period of one month during July of 1966, the rainy season.

The second station, Barra del Colorado, will be treated only briefly because it was worked but for a few days. It is located in the northeast portion of Costa Rica at the mouth of the Rio Colorado, Lat. 10° 40′ N, Long. 83° 35′ W.

Collecting was confined to the shallow water or littoral fauna in both stations and included beach specimens and drift material. A face mask was used in the shallow areas and on the reefs. Algae were sorted and picked through for the smaller species and drift material was selected and carefully sorted with the aid of a stereomicroscope for the smaller micromollusks. The *Thalassia* beds and sandy bottoms were sifted with $\frac{1}{4}$ inch mesh strainers. When possible, specimens were obtained from local fishermen. No dredging was undertaken, but this would undoubtedly have increased the faunal list by adding more burrowers and pelecypods.

COLLECTING STATIONS

STATION 1: PORTETE

This area (Map, Figure 2) consists primarily of rocky shoreline, surf-washed coves and a somewhat protected lagoon. A small freshwater creek empties into the lagoon and to the north and south of this station there are rivers emptying their muddy contents into the sea. Rainfall can be heavy during the wet season and is undoubtedly a factor in the salinity of the shallow portions of the coast at this time.

Unfortunately, quantitative data for many of the ecological factors of this area are not known. However, the author's short experience in the area produced some qualitative information which indicates some factors of possible ecological significance and will serve as a basis for future investigation.

No record of the variations of sea temperatures was compiled, but temperatures appear to be typical of the shallow waters of the Caribbean. Values of the oceanic quadrant 10 - 15° N, 80 - 85° W have been used. In this quadrant, sea surface temperatures average 27.3° C with a range of mean monthly values of 2° (D. R. Moore, personal communication). Very shallow areas become much warmer during the day due to the effect of the sun. The same is true of the local effects of cooling due to the heavy rains in the wet season. Variations, however, do not appear to be of any significance in the distribution of the common mollusks.

Due to the prevailing trade winds (E – NE) there is a consistent wave action. Periods of severe storms cause wave action to become sufficiently intense to damage the plant and coral growth and to destroy certain ecological environments. In sandy areas the author observed mollusks torn from their substrate and cast up on the beaches by heavy surf action. Wave action seems fairly consistent around this station.

Tides at Portete are diurnal, having a range of 1.2 feet and a mean tide level of 0.3 feet. There are no noticeable strong local currents at this station, but currents related to the wind nearly always flow W – SW.

The ranges of salinity do not seem to be of a magnitude to be detrimental to coral growth and the typical reef-dwelling fauna. The expected forms of mollusks were found except along the margin of the lagoon area into which the freshwater creek emptied. A water sample from this station was taken and analysis of it showed a salinity of 34.083 ppt. Heavy rains can apparently change the salinity in the more shallow portions along the shore and increase the magnitude of the nearby river's discharge.

Turbidity is influenced by the constant wave action. There is a moderate amount of sedimentation contributed by the rivers and creeks near this region. The portion of the lagoon directly affected by the discharge of the creek is devoid of the usual fauna. During periods of heavy rain it appears to discharge considerable quantities of sand and mud, creating a sand bar near its mouth.

Bottom conditions in Portete do not vary greatly. The one exception is the lagoon area where substrate conditions were extensively controlled and modified by flora and fauna and were quite varied.

Substrate conditions at Portete were mostly of 3 types: mud-sand bottom, *Thalassia*-sand flats, and rock-coral bottom. Intermediates and mixtures of these types were present, some areas apparently in transition from one type of bottom to another, but in general the variations of substrates were strikingly defined. For the purpose of study the writer divides the station of Portete into 3 general areas of substrate mentioned above.

A. Mud-Sand Bottom

The mud-sand bottom has a fine film of algal growth covering the sediment and is found only in the center of the lagoon; it extends back toward the shore near the creek. The freshwater creek and its mouth are included in this type of bottom. Few mollusks are found on this substrate, but *Strombus pugilis* is abundant. Water usually covers the mud-sand bottom to a depth of 5 feet or more. No portions of this type bottom seem to be exposed at low tide.

B. *Thalassia*-Sand Bottom

The *Thalassia* flats are all intertidal in nature and prove to be the most rewarding areas in the number of species encountered. The most extensive *Thalassia* beds are confined to the south shores of the lagoon. They consist of beds of *Thalassia* in the deeper portions which slope upward, forming shallow flats of mixed *Thalassia, Caulerpa, Halimeda* and *Porites.* The water is seldom more than a foot deep here and with low tide there are periods of incomplete exposure. Along the shore this area appears sandy with large rocks and occasional *Thalassia.*

C. Rock and Coral Bottom

Rock bottom environments are the most common and are usually covered with marine algae and corals. They are exposed to the wave action and in some places heavily pounded by surf. In areas of this substrate definite zones characterized by certain flora and fauna are noticed. A zone as defined by RODRIGUEZ (1959) is a "band or region in the shore defined by physical conditions." Zonation was, in many instances, reflected by the types of mollusks found. It is most apparent in areas which are affected by the tides. Substrate, wave action, and the distribution of bottom types are lesser contributing factors in zonation. LEWIS (1960) found that tides, with the varying degrees of exposure they impose, are the primary cause of zonation. This certainly appears to be the case at Portete as zonation is remarkably constant in most rocky areas. Mollusks of these zones show varying degrees of adaptation to tidal factors. That this is due to their larval stages is evident, for the success of these mollusks is not only due to their ability to maintain themselves as adults, but should be considered as the sum of successes of the various stages in their life histories.

For purposes of convenience, rocky areas are divided into 5 zones which seemed to predominate at Portete. This partially follows the zonation system of Arnow, St. Clair, & Arnow, 1963.

1. Splash Zone – the area above the mean high water levels, including splash pools, areas affected by spray and beach debris.

2. Intertidal Zone – the area between mean high and mean low water levels. An area of loose rocks and stones, sandy-bottom pools and shallow water and frequently completely exposed by tidal action.

3. Rock-Ledge Zone – the subtidal shelf that fringes the coast. It is transversed by cracks filled with holes and niches. Heavy growths of *Padina, Hypnea,* and *Acanthopora* and other algae are predominant here. This zone is narrow in most parts of Portete; however, in one area the rocky ledges are quite extensive.

4. Reef Zone – this zone is characterized by coral growth and deeper water. At the edge of this zone and along the outer edge of the rocky shelf zone are heavy growths of *Zoanthus.* Further out *Siderastraea* and *Acropora* coral are common. The hydrocoral *Milleporina* is abundant in this zone. Wave action is generally heavy.

5. Tidal Creek Zone – an unusual cleft cut through the promontory which formed one side of the lagoon. This promontory is heavily pounded by waves on its outer, southern portion. The water thus enters a cleft in the cliff-like sides and forms a salt water creek which eventually enters the lagoon and is subject to tidal action. It is a protected zone, always in the shade, and in some places the creek is almost 15 feet deep. The sea urchin *Diadema* is common on the bottom. Shallow areas are covered with a fine filamentous green alga.

STATION 2: BARRA DEL COLORADO

An area of wide sandy beaches bisected by the estuary of the muddy Rio Colorado, the Barra del Colorado is bordered by wet, tropical rain forest. The beaches are broad and slope gently into the turbid sea. This area is quite similar to that of Tortuguero described by Carr (1956).

No ecological data were recorded, but substrate conditions along the beaches are of the sand-bottom type. No collecting was done in the estuarine areas, but Kelso (1965) found *Polymesoda triangula, Mytilopsis zeteki,* and *Neritina reclivata* to be common in the Tortuguero estuary further south.

This station afforded a number of species and habitat records of mollusks not encountered at Portete.

SUMMARY of SURVEY and CONCLUSIONS

A checklist of the species collected in Limón Province whose presence in the Western Caribbean was previously unrecorded in the literature follows:

Arene tricarinata (Stearns, 1872)
Astraea tuber (Linnaeus, 1758)
Tegula viridula (Gmelin, 1791)
Puperita tristis (Orbigny, 1842)
Parviturboides interruptus (C. B. Adams, 1850)
Solariorbis infracarinata Gabb, 1881
Heliacus bisulcatus Orbigny, 1845
Heliacus infundibuliformis (Gmelin, 1791)
Petaloconchus irregularis (Orbigny, 1842)
Caecum jucundum Folin, 1867
Caecum ryssotitum Folin, 1867
Caecum cycloferum Folin, 1867
Cerithium auricoma Schwengel, 1940
Cerithiopsis pupa Dall & Simpson, 1901
Cerithiopsis latum (C. B. Adams, 1850)
Cerithiopsis bicolor (C. B. Adams, 1845)
Triphora nigrocincta (C. B. Adams, 1839)
Triphora pulchellum (C. B. Adams, 1850)
Balcis intermedia Cantraine, 1835
Balcis conoidea Kurtz & Simpson, 1851
Eulima auricincta Abbott, 1958
Stilifer subulatus Broderip & Sowerby
Risomurex roseus Reeve, 1856
Anachis pulchella Sowerby, 1844
Bailya parva (C. B. Adams, 1850)
Colubraria lanceolata Menke, 1828
Nassarius nanus Usticke, 1959
Pusia gemmata (Sowerby, 1874)
Marginella denticulata Conrad, 1830
Bullata ovuliformis (Orbigny, 1842)
Hyalina tenuilabra Tomlin, 1917
Crassispira fuscescens (Reeve, 1843)
Leptadrillia splendida Bartsch, 1934
Mangelia fusca (C. B. Adams, 1845)
Pyrogocythara coxi Fargo, 1953
Retusa candei Orbigny, 1841
Aplysia brasiliana Rang, 1828
Aplysia dactylomela Rang, 1828
Cingulina babylonia (C. B. Adams, 1845)
Miralda havanensis Pilsbry & Aguayo

Lobiger souverbii Fischer, 1856
Tralia ovula (Bruguière, 1789)
Arca imbricata Bruguière, 1789
Pteria colymbus Röding, 1798
Crassinella martinicensis (Orbigny, 1842)
Condylocardia bernardi Dall, 1903
Mytilopsis domingensis (Recluz, 1852)
Diplodonta notata Dall & Simpson, 1901
Codakia costata Orbigny, 1842
Acanthochitona rhodeus Pilsbry, 1893
Octopus vulgaris Lamarck, 1798

Of the Recent mollusks found in eastern Costa Rica, a total of nearly 250 species were collected consisting of 181 species of gastropods, 35 pelecypods, 3 scaphopods, 8 chitons, and 2 cephalopods. Table 1 illustrates their composition.

Table 1

Composition of Molluscan Fauna

		Fam.	Genera	Spec.
	Prosobranchia	43	88	161
GASTROPODA	Opisthobranchia	9	12	16
	Pulmonata	1	3	3
PELECYPODA		19	30	35
AMPHINEURA		3	5	8
SCAPHOPODA		2	2	2
CEPHALOPODA		2	2	2

Twelve families are represented by only one species. The families best represented are the Vitrinellidae with 8 genera and the Cerithiidae with 5. The best represented genera are *Rissoina* with 9 species, *Caecum* and *Cerithiopsis* with 6 species each, and *Nerita, Epitonium,* and *Triphora,* each represented by 4 species. Sixteen species of Opisthobranchs remained unidentified. Thirty-five species of bivalves were collected of which the largest shares were of the families Arcidae and Tellinidae.

Table 2

Ecological Distribution
of Limón Province Marine Mollusks

	P	G	A	S[1]
Sand bottom species	11	0	0	3
Mud-sand bottom species	3	3	0	0
Thalassia-sand bottom species	7	38	0	0
Rock-coral bottom species	8	56	7	0

A summary of the general ecological distribution of mollusks collected alive follows in Table 2.

The mollusks collected in this survey have been deposited in the following places: Division of Mollusks, U. S. National Museum; Museum of Comparative Zoology, Harvard University; Museum of the Institute of Marine Science, University of Miami; and in the writer's collection.

SYSTEMATICS

The following systematic listing includes all identified mollusks collected by the author in Limón Province, Costa Rica. Some unidentified opisthobranchs and many micromollusks have been omitted from the list. Although nearly 210 species were determined, this in no way implies a complete survey.

In this checklist an attempt is made to record the general distribution of each species throughout the Caribbean Province. The stations and ecological areas where the species were collected then follows, together with additional information of interest. Many species were not found alive and are indicated as beach drift or beach shells.

The classification used in this paper is based upon that of Warmke & Abbott, 1961. The general geographical ranges of mollusks were taken principally from the monographs in Johnsonia, from publications by Warmke & Abbott (1961) and Abbott (1954; 1958).

Stations, areas and zones appear after the general range information and are assigned symbols as follows:

P = Portete

m = mud-sand bottom
t = *Thalassia*-sand bottom
r = rock-coral bottom

1 = splash zone
2 = intertidal zone
3 = rockledge zone
4 = reef zone
5 = tidal creek zone

B = Barra del Colorado

The terms "abundant," "common," etc. indicate the relative occurrence of the species:

abundant = 100 or more
common = 15 to 100
uncommon = 6 to 15
rare = 5 or fewer

Species with doubtful determination are indicated by a question mark in parenthesis: (?).

---

[1] P = Pelecypoda; G = Gastropoda; A = Amphineura
S = Scaphopoda

GASTROPODA

SCISSURELLIDAE

Scissurella ORBIGNY, 1823

Scissurella sp., P, beach drift. Rare.

FISSURELLIDAE

Hemitoma SWAINSON, 1840

Hemitoma octoradiata (GMELIN, 1791). Range: south Florida and the Caribbean to Brazil. P, r, 2. Found during March in holes and pits on rocks. Uncommon.

Diodora GRAY, 1821

Diodora listeri (ORBIGNY, 1853). Range: southeast Florida and the southeast Caribbean. P, r, 2, 3. Uncommon on rocks.

Diodora arcuata (SOWERBY, 1862). Range: Florida, the Bahamas and the Caribbean. P, t. Uncommon under stones and dead *Porites* coral. Common in beach drift.

Fissurella BRUGUIÈRE, 1798

Fissurella nodosa (BORN, 1778). Range: lower Florida Keys, southern Mexico and the Caribbean. P, r, 3. Commonly covered with calcareous algae. Common.

Fissurella angusta (GMELIN, 1791). Range: the lower Florida Keys, the Bahamas, British Guiana and the east coast of Central America. P, r, 2, 3. Found living in depressions on rocks and exposed flats. Common.

Fissurella barbadensis (GMELIN, 1791). Range: southeast Florida, Bermuda, West Indies, and the Caribbean coast of Central America. P,r, 2, 3. Common on rocks and ledges.

ACMAEIDAE

Acmaea ESCHSCHOLTZ, 1830

Acmaea antillarum (SOWERBY, 1831). Range: south half of Florida to the West Indies and the Caribbean. P, r, 2, 3. Found in cup-like depressions on rocks and ledges exposed to heavy surf. Common.

TROCHIDAE

Cittarium PHILIPPI, 1847

Cittarium pica (LINNAEUS, 1758). Range: Bahamas to the West Indies and eastern Central America; north coast of South America. P, r, 3. Commonly found adhering to alga-covered rocks in surf-pounded places; younger specimens were common in the intertidal zone during the month of March, but were absent in the summer.

Tegula LESSON, 1832

Tegula fasciata (BORN, 1778). Range: southeastern Florida and the Caribbean. P, t. Found commonly on *Thalassia* blades.

Tegula excavata (LAMARCK, 1822). Range: Caribbean. P, r, 2. Found only during March under rocks or in sheltered places. Common.

Tegula viridula (GMELIN, 1791). Range: Central America and the northern coast of South America to Brazil. P, t. Found in *Thalassia* beds. Uncommon.

Parviturbo PILSBRY & MCGINTY, 1945

Parviturbo sp. P. Beach drift. Common.

TURBINIDAE

Arene H. & A. ADAMS, 1857

Arene tricarinata (STEARNS, 1872). Range: southeast U. S. to the West Indies and eastern Central America. P, t. Uncommon. Common in beach drift.

Astraea RÖDING, 1798

Astraea caelata (GMELIN, 1791). Range: southeast Florida, the West Indies and the Caribbean. P, r. Shells only. FLUCK, 1905, found it abundant in Nicaragua.

Astraea tuber (LINNAEUS, 1758). Range: southeast Florida, the West Indies and the Caribbean. P, r. One dead specimen.

PHASIANELLIDAE

Tricolia RISSO, 1826

Tricolia affinis cruenta ROBERTSON, 1958. Range: Western Gulf of Mexico and the Caribbean to Brazil. P, t. Common; abundant in beach drift.

NERITIDAE

Nerita LINNAEUS, 1758

Nerita peloronta LINNAEUS, 1758. Range: eastern Florida, Bermuda and the West Indies to Trinidad, and also eastern Central America. P, r, 1. Found only during March. Uncommon on large rocks.

Nerita versicolor GMELIN, 1791. Range: Florida to Texas, Bermuda and the Caribbean to Brazil. P, r, 2. Abundant on wet rocks in shaded areas.

Nerita fulgurans GMELIN, 1791. Range: eastern coast of Florida, Bermuda, the Caribbean and Brazil. P, r, 2. Common under rocks in sheltered places. RUSSELL, 1941, stated that this species is found in waters of lower salinity but this writer found it commonly distributed along the rocky shores of the Limón peninsula.

Puperita Gray, 1857

Puperita tristis (Orbigny, 1842). Range: Antilles and eastern Central America. P, t. Abundant only in lagoons on stones, dead coral, and debris.

Neritina Lamarck, 1816

Neritina virginea (Linnaeus, 1758). Range: Florida to Texas, Bermuda and the Caribbean to Brazil. P, m. Found only near mouth of fresh water creek. Few live specimens taken. Common in beach drift.

Neritina meleagris Lamarck, 1822. Range: British Honduras to Columbia and the Antilles to Brazil. P, t. Found on rocks and debris with *Puperita tristis*. Common.

Neritina piratica Russell, 1940. Range: Central America, the Antilles, the north coast of South America to Brazil. P, m. Common in freshwater creek on submerged logs and leaves. Intergrades in color pattern ranged from typical *N. piratica* markings to *N. reclivata* and *N. zebra* types, but Russell (1941) claimed there is no intergrading of species. Fluck (1905) found this species to be common in the lagoons and channels peculiar to the mosquito coast of Nicaragua.

Smaragdia Issel, 1869

Smaragdia viridis viridemaris Maurey, 1917. Range: southeast Florida, Bermuda, Veracruz to Yucatan, Mexico, and the Caribbean. P, t. Common.

Littorinidae

Littorina Férussac, 1822

Littorina ziczac (Gmelin, 1791). Range: southern Florida to Texas, Bermuda and the Caribbean, the Pacific side of Panama near the canal and South America to Uruguay. P, r, 1, 2. Abundant in splash zone.

Littorina lineolata Orbigny, 1842. Range: southern Florida to Texas and the Caribbean. P, r, 1, 2. Abbott, 1964, has pointed out the close resemblance between this species and *L. ziczac*. *Littorina lineolata* was usually found in wetter areas; it is smaller and of a deeper color. Abundant in intertidal zone.

Littorina nebulosa (Lamarck, 1822). Range: the Gulf of Mexico and the Caribbean. P, r, 1. Found on rocks, trees, and debris. Common.

Nodilittorina von Martens, 1897

Nodilittorina tuberculata (Menke, 1828). Range: southern Florida, Bermuda and the Caribbean. P, r, 1. Common in holes and pitted surfaces on rocks.

Tectarius Valenciennes, 1833

Tectarius muricatus (Linnaeus, 1758). Range: lower Florida Keys, Bermuda and the Caribbean. P, r, 1. Common on rocks and vegetation.

Truncatellidae

Truncatella Risso, 1826

Truncatella pulchella bilabiata Pfeiffer, 1839. Range: southeast U. S. and the Caribbean. P, r, 1. Common in rotting vegetation under rocks and debris.

Rissoidae

Rissoina Orbigny, 1840

Rissoina chesneli (Michaud, 1830). Range: southeast U. S. and the West Indies. P, beach drift. Common.

Rissoina decussata (Montagu, 1803). Range: North Carolina to the Lesser Antilles and Central America. P, beach drift. Uncommon.

Rissoina aberrans (C. B. Adams, 1850). Range: Gulf of Mexico and the Caribbean. P, beach drift. Uncommon.

Rissoina toroensis (Olsson & McGinty, 1958). Range: Central America. P, beach drift. Uncommon.

Rissoina cancellata Philippi, 1847. Range: southeast Florida and the West Indies. P, beach drift. Uncommon.

Rissoina sp. P, beach drift. Common.

Rissoina sp. P, beach drift. Common.

Zebina H. & A. Adams, 1855

Zebina browniana (Orbigny, 1842). Range: Carolinas to the West Indies. P, t. Under stones and debris in *Thalassia* beds; beach drift. Abundant.

Alvania Risso, 1826

Alvania auberiana (Orbigny, 1842). Range: West Indies. P, beach drift. Uncommon.

Alvania chiriquiensis Olsson & McGinty, 1958. Range: Central America. P, beach drift. Rare.

Vitrinellidae

Vitrinella C. B. Adams, 1852

Vitrinella elegans Olsson & McGinty, 1958. Range: Central America. P, beach drift. Rare.

Vitrinella heliocoidea C. B. Adams, 1850. Range: southeast U. S., the West Indies, and the east coast of Central America. P, beach drift. Uncommon.

Cyclostremiscus Pilsbry & McGinty, 1945

Cyclostremiscus jeannae Pilsbry & McGinty, 1945. Range: Central America. P, beach drift. Uncommon.

Cyclostremiscus schrammii (Fischer, 1857). Range:

Guadeloupe and Central America. P, beach drift. Uncommon.

Cyclostremiscus ornatus Olsson & McGinty, 1958. Range: Florida and the Caribbean. P, beach drift. Uncommon.

Teinostoma H. & A. Adams, 1854

Teinostoma megastoma (C. B. Adams, 1850). Range: Carolinas to the Caribbean. P, beach drift. Common.

Parviturboides Pilsbry & McGinty, 1950

Parviturboides interruptus (C. B. Adams, 1858). Range: South Carolina to Gulf of Mexico and the Caribbean. P, beach drift. Common.

Solariorbis Conrad, 1865

Solariorbis blakei Rehder, 1944. (?) Range: South Carolina to the Gulf of Mexico and the Caribbean. P, beach drift. Rare.

Solariorbis infracarinata Gabb, 1881. Range: North Carolina to the Gulf of Mexico and the Caribbean. P, beach drift. Uncommon.

Solariorbis sp. P, beach drift. Rare.

Vitrinorbis Pilsbry & Olsson, 1952

Vitrinorbis elegans Olsson & McGinty, 1958. Range: Central America. P, beach drift. Rare.

Circulus Jeffreys, 1865

Circulus semisculptus (Olsson & McGinty, 1958). Range: southern Florida and Central America. P, beach drift. Uncommon.

Macromphalina Cossmann, 1888

Macromphalina sp. P, beach drift. Rare.

ARCHITECTONICIDAE

Heliacus Orbigny, 1842

Heliacus bisulcatus Orbigny, 1845. Range: southeast U. S. and the Caribbean. P, beach drift. Uncommon.

Heliacus infundibuliformis (Gmelin, 1791). (?) Range: Caribbean. P, beach drift. Rare.

VERMETIDAE

Petaloconchus H. C. Lea, 1843

Petaloconchus irregularis (Orbigny, 1842). Range: southern Florida and the Caribbean. P, r, 2. Cemented on rocks. Common.

Stephopoma Mörch, 1860

Stephopoma myrakeenae Olsson & McGinty, 1958. Range: Central America. P, beach drift. Uncommon.

CAECIDAE

Caecum Fleming, 1813

Caecum pulchellum Stimpson, 1851. Range: eastern U. S. and the Caribbean. P, beach drift. Common.

Caecum jucundum Folin, 1867. Range: Caribbean. P, beach drift. Abundant.

Caecum ryssotitum Folin, 1867. Range: Florida and the Caribbean to Brazil. P, beach drift. Abundant.

Caecum clava Folin, 1867. Range: Caribbean. P, beach drift. Rare.

Caecum cycloferum Folin, 1867. Range: Central America. P, beach drift. Rare.

Caecum sp. P, beach drift. Rare.

PLANAXIDAE

Planaxis Lamarck, 1822

Planaxis lineatus (da Costa, 1778). Range: lower Florida Keys and the Caribbean. P, r, 2. Abundant beneath rocks.

Planaxis nucleus (Bruguière, 1789). Range: southeast Florida and the Caribbean. P, r, 2. Abundant on rocks.

MODULIDAE

Modulus Gray, 1842

Modulus modulus (Linnaeus, 1758). Range: Florida to Texas, Bermuda, and the Caribbean to Brazil. P, t. Screened in *Thalassia* beds. Uncommon.

Modulus carchedonius (Lamarck, 1822). (?) Range: Greater Antilles to the north coast of South America and Central America. P, beach drift. Rare.

CERITHIIDAE

Cerithium Bruguière, 1789

Cerithium variabile C. B. Adams, 1845. Range: southern Florida to Texas and the Caribbean. P, t, r, 2. Abundant in July; uncommon in March.

Cerithium eburneum Bruguière, 1792. Range: southeast Florida, the Bahamas and the Greater Antilles, to Central America. P, r, 5; t. Abundant on rocks; uncommon in *Thalassia* area.

Cerithium auricoma Schwengel, 1940. Range: Florida and the Caribbean. P, beach. Uncommon.

Bittium Gray, 1847

Bittium varium (Pfeiffer, 1840). Range: Maryland to Florida, Texas, Mexico and the Caribbean. P, t. Under rocks and debris in *Thalassia* beds. Uncommon; common in beach drift.

Alaba H. & A. ADAMS, 1853

Alaba incerta (ORBIGNY, 1842). Range: Bermuda, Bahamas, southeast Florida and the Caribbean. P, t. Screened in deeper portions of *Thalassia* beds. Also found in beach drift. Uncommon.

Cerithiopsis FORBES & HANLEY, 1851

Cerithiopsis greeni (C. B. ADAMS, 1839). Range: Cape Cod to Florida and the Caribbean. P, t. Common alive under stones in *Thalassia* beds. Abundant in beach drift.

Cerithiopsis regulosum (C. B. ADAMS, 1850). Range: Caribbean. P, beach drift. Uncommon.

Cerithiopsis latum (C. B. ADAMS, 1850). Range: Greater Antilles and Central America. P, beach drift. Uncommon.

Cerithiopsis pupa DALL & STIMPSON, 1901. Range: Greater Antilles and Central America. P, beach drift. Rare.

Cerithiopsis emersoni (C. B. ADAMS, 1838). Range: Massachusetts to the Caribbean. P, r, 5. Rare.

Cerithiopsis bicolor (C. B. ADAMS, 1845). P, r, 5. Screened in green algae on rocks. Rare.

Seila A. ADAMS, 1861

Seila adamsi (H. C. LEA, 1845). Range: Massachusetts to Florida, Texas and the Caribbean. P, t. Common under stones and also in beach drift.

TRIPHORIDAE

Triphora BLAINVILLE, 1828

Triphora turristhomae HOLTEN, 1802. Range: Caribbean. P, t. Also in beach drift. Uncommon.

Triphora nigrocincta (C. B. ADAMS, 1839). Range: Massachusetts to Florida, Texas and the Caribbean. P, t. Uncommon.

Triphora ornata DESHAYES, 1832. Range: Florida and the Caribbean. P, beach drift. Rare.

Triphora pulchellum C. B. ADAMS, 1850. Range: Caribbean. P, beach drift. Uncommon.

Triphora sp. P, beach drift. Uncommon.

EPITONIIDAE

Epitonium RÖDING, 1798

Epitonium krebsi (MÖRCH, 1874). Range: southern Florida to Lesser Antilles and Central America. P, beach drift. Uncommon.

Epitonium albidum (ORBIGNY, 1842). Range: south Florida to Argentina. P, t. Rare.

Epitonium lamellosum (LAMARCK, 1822). Range: southern Florida and the Caribbean. Also Europe. P, beach drift. Uncommon.

Epitonium candeanum (ORBIGNY, 1842). Range: southern Florida to the Barbados and Central America. P, uncommon in beach drift.

EULIMIDAE

Balcis LEACH, 1847

Balcis intermedia (CANTRAINE, 1835). Range: New Jersey to the Caribbean. Also Europe. P, t. Uncommon.

Balcis conoidea KURTZ & STIMPSON, 1851. Range: Florida, the Gulf of Mexico and the Caribbean. P, uncommon in beach drift.

Balcis sp. P, beach drift. Uncommon.

Balcis sp. P, beach drift. Uncommon.

Eulima RISSO, 1826

Eulima auricincta ABBOTT, 1958. Range: southern U. S. to Greater Antilles and Central America. P, uncommon in beach drift.

STILIFERIDAE

Stilifer BRODERIP, 1832

Stilifer subulatus BRODERIP & SOWERBY, 1832. Range: Caribbean. P, rare in beach drift.

Athleenia BARTSCH, 1946

Athleenia burryi BARTSCH, 1946. Range: southern Florida and eastern Costa Rica. P, rare in beach drift.

HIPPONICIDAE

Cheilea MODEER, 1793

Cheilea equestris (LINNAEUS, 1758). Range: southeast Florida and the Caribbean. P, common in beach drift.

Hipponix DEFRANCE, 1819

Hipponix antiquatus (LINNAEUS, 1767). Range: southeast Florida and the Caribbean. P, common in beach drift.

Hipponix subrufus subrufus (LAMARCK, 1822). (?) Range: southeast Florida and the Caribbean. P, common in beach drift.

FOSSARIDAE

Fossarus PHILIPPI, 1841

Fossarus orbignyi FISCHER, 1864. Range: Caribbean. P, common in beach drift.

Fossarus sp. P, beach drift. Uncommon.

STROMBIDAE

Strombus LINNAEUS, 1758

Strombus gigas LINNAEUS, 1758. Range: southeast Florida, Bermuda and the Caribbean. P. Only a few broken pieces of this species were found.

Strombus pugilis LINNAEUS, 1758. Range: southeast Florida through the Caribbean to Brazil. P, m. This species was found in deeper water in the center of the lagoon on a bottom covered with sediment and a fine algal mat. It was abundant in July. The specimens appear to be typical *S. pugilis* and do not have the characteristics of *S. pugilis nicaraguensis* as described by FLUCK in 1905.

Strombus raninus GMELIN, 1791. Range: southeast Florida and the Caribbean. P, t. Uncommon.

ERATOIDAE

Trivia BRODERIP, 1837

Trivia leucosphaera SCHILDER, 1931. Range: southeast U. S. and the Caribbean. P, beach drift. Uncommon.

CYPRAEIDAE

Cypraea LINNAEUS, 1758

Cypraea zebra LINNAEUS, 1758. Range: southeast Florida and the Caribbean. P, r, 2. Found with egg masses in March. Uncommon under large rocks.

Cypraea cinerea GMELIN, 1791. Range: southeast Florida and the Caribbean. P, beach drift. Common.

NATICIDAE

Polinices MONTFORT, 1810

Polinices lacteus (GUILDING, 1834). Range: southeastern U. S. and the Caribbean. P, beach drift. Uncommon. FLUCK (1905) found it abundant in Nicaragua.

CASSIDIDAE

Cypraecassis STUTCHBURY, 1837

Cypraecassis testiculus (LINNAEUS, 1758). Range: southeast Florida, Bermuda and from South Mexico and the Caribbean to Brazil. P. Uncommon.

CYMATIIDAE

Charonia GISTEL, 1848

Charonia variegata (LAMARCK, 1816). Range: southeast Florida and the West Indies. P, r, 3, 4. Usually covered with thick coralline algal growth. Common.

Cymatium RÖDING, 1798

Cymatium pileare (LINNAEUS, 1758). Range: southeastern U. S. to the Caribbean. P, beach drift. Common.

BURSIDAE

Bursa RÖDING, 1798

Bursa cubaniana (ORBIGNY, 1842). Range: southeast Florida and the Caribbean. P, r, 2. Uncommon under large rocks in March.

TONNIDAE

Tonna BRUNNICH, 1772

Tonna maculosa (DILLWYN, 1817). Range: southeast Florida and the Caribbean to Brazil. P, beach fragments. Uncommon.

MURICIDAE

Drupa RÖDING, 1798

Drupa nodulosa (C. B. ADAMS, 1845). Range: southern Florida and the Caribbean. P, r, 2; t. Common under rocks.

Risomurex OLSSON & MCGINTY, 1958

Risomurex roseus (REEVE, 1856). Range: throughout the Caribbean. P, r, 2. Uncommon under rocks.

Risomurex muricoides (C. B. ADAMS, 1845). Range: Caribbean. P, beach drift. Uncommon.

Purpura BRUGUIÈRE, 1789

Purpura patula (LINNAEUS, 1758). Range: southeast Florida and the Caribbean. P, r, 2. Found in depressions on wave-dashed rocks. LEWIS (1960) stated that this species feeds on *Acanthopleura granulata*, which is abundant in this zone. Common. Larger specimens eroded.

Thais RÖDING, 1798

Thais rustica (LAMARCK, 1822). Range: southeast Florida, Bermuda and the Caribbean. P, r, 2, 3. Common.

Thais deltoidea (LAMARCK, 1822). Range: Florida, Bermuda and the Caribbean. P, r, 2, 3. Found on rocks covered with *Hypnea* and *Acanthophora*. Common.

Aspella MÖRCH, 1877

Aspella paupercula (C. B. ADAMS, 1850). Range: Caribbean. P, t. Uncommon under rocks and dead *Porites* coral.

MAGILIDAE

Coralliophila H. & A. ADAMS, 1853

Coralliophila caribaea ABBOTT, 1958. Range: southeast Florida and the Caribbean. P, t, r, 4. Uncommon.

COLUMBELLIDAE

Columbella LAMARCK, 1799

Columbella mercatoria (LINNAEUS, 1758). Range: southeast Florida and the Caribbean. P, t. Uncommon on *Thalassia* blades.

Anachis H. & A. ADAMS, 1853

Anachis catenata (SOWERBY, 1844). Range: Bermuda and the Caribbean. P, r, 3, 4. Found in colonies under rocks and coral heads. Uncommon.

Anachis obesa (C. B. ADAMS, 1845). Range: Virginia to Florida, the Gulf of Mexico and the Caribbean. P, r, 2, t. Common under stones.

Anachis pulchella (SOWERBY, 1844). Range: Florida Keys and the Caribbean. P, t. Rare.
Anachis sp. P, beach drift. Rare.

Nitidella SWAINSON, 1840

Nitidella ocellata (GMELIN, 1791). Range: lower Florida Keys, Bermuda and the Caribbean. P, beach drift. Uncommon.

Psarostola REHDER, 1943

Psarostola monilifera (SOWERBY, 1894). Range: Florida and the Caribbean. P, uncommon in beach drift.

BUCCINIDAE

Bailya M. SMITH, 1944

Bailya parva (C. B. ADAMS, 1850). Range: Bahamas and the Caribbean. P, t, r, 4. Found under dead *Porites* coral and in company with *Aspella paupercula* under coral heads.

Bailya intricata (DALL, 1883). (?) Range: southern Florida and the Caribbean. P, t. Uncommon under stones and rubble.

Antillophos WOODRING, 1928

Antillophos candei (ORBIGNY, 1853). (?) Range: southeast U. S. and the Caribbean. P, t. Uncommon under dead *Porites* coral.

Engina GRAY, 1839

Engina turbinella (KIENER, 1836). Range: lower Florida Keys and the Caribbean. P, t. Found under stones in sheltered areas. Common.

Engina sp. P, beach drift. Rare.

Colubraria SCHUMACHER, 1817

Colubraria lanceolata MENKE, 1828. Range: southeast U. S. and the Caribbean. P, beach drift. Uncommon.

Pisania BIVONA-BERNARDI, 1832

Pisania pusio (LINNAEUS, 1758). Range: southeast Florida and the Caribbean. P, r, 4. Uncommon.

Cantharus RÖDING, 1798

Cantharus auritulus (LINK, 1807). Range: southeast Florida, south through the Caribbean to Brazil. P, beach specimens. Rare.

NASSARIIDAE

Nassarius DUMÉRIL, 1806

Nassarius vibex (SAY, 1822). Range: Cape Cod to Florida, the Gulf States and the Caribbean. P, t. Found on *Thalassia* in deeper water.

Nassarius albus (SAY, 1826). Range: southeastern U. S. to the Caribbean. P, beach drift. Uncommon.

Nassarius nanus USTICKE, 1959. Range: Caribbean. P, t. Uncommon.

FASCIOLARIIDAE

Leucozonia GRAY, 1847

Leucozonia nassa (GMELIN, 1791). Range: Florida to Texas and the Caribbean. P, r, 2, 3. Common under rocks covered with coralline algae.

Leucozonia ocellata (GMELIN, 1791). Range: Florida and the Caribbean. P, beach specimen.

XANCIDAE

Vasum RÖDING, 1798

Vasum muricatum (BORN, 1778). Range: southern Florida and the Caribbean. P, t, r, 4. Common on rocks and debris.

OLIVIDAE

Oliva BRUGUIÈRE, 1789

Oliva reticularis LAMARCK, 1811. Range. southeast Florida, the Bahamas and the Caribbean. P; B. Beach fragments. Rare.

Agaronia GRAY, 1839

Agaronia testacea (LAMARCK, 1811). Range: Central America and in the Panamic Province from the Gulf of California to Peru. P, t. FLUCK (1905) found this species to be abundant in Nicaragua and observed the living animals. OLSSON (1958) also listed it from Panama. TRYON (1883) found it to be indistinguishable from *A. hiatula* (GMELIN, 1791) from West Africa and added that both species exhibited a wide variation in both color and form. Uncommon, dead.

Olivella SWAINSON, 1831

Olivella minuta LINK, 1897. Range: Caribbean. P, beach drift. Uncommon. This may be the subspecies *O. minuta marmosa* since OLSSON & MCGINTY, 1958, list it as occurring nearby in Panama.

MITRIDAE

Mitra LAMARCK, 1799

Mitra nodulosa (GMELIN, 1791). Range: southeast U. S. and the Caribbean. P, r, 4. Uncommon under coral heads.

Mitra barbadensis (GMELIN, 1791). Range: from southeast Florida to the Caribbean. P, uncommon.

Mitra olssoni MCGINTY, 1955. (?) Range: southeastern Florida and Central America. P, beach drift. Rare.

Pusia SWAINSON, 1840

Pusia gemmata (SOWERBY, 1874). Range: Florida and the Caribbean. P, r, 5. Common under rocks and on algae.

MARGINELLIDAE

Marginella LAMARCK, 1799

Marginella denticulata CONRAD, 1830. Range: southeast U. S. to the Caribbean. P, beach drift. Common.

Bullata JOUSSEAUME, 1875

Bullata ovuliformis (ORBIGNY, 1842). Range: the southeast U. S. and the Caribbean. P, uncommon in beach drift.

Persicula SCHUMACHER, 1817

Persicula adamsiana weberi OLSSON & MCGINTY, 1958. Range: Central American coast. P, rare in beach drift.

Persicula lavalleana (ORBIGNY, 1842). Range: southern Florida and the Caribbean. P, uncommon in beach drift.

Hyalina SCHUMACHER, 1817

Hyalina avena KIENER, 1834. Range: southeast U. S. and the Caribbean. P, uncommon in beach drift.

Hyalina tenuilabra TOMLIN, 1917. Range: Florida to the Caribbean. P, uncommon in beach drift.

CONIDAE

Conus LINNAEUS, 1758

Conus regius GMELIN, 1791. Range: Florida to southern Mexico, the Bahamas and the Caribbean south to Brazil. P, r, 4. No living specimens were taken.

Conus mus HWASS, 1792. Range: southern Florida to the Caribbean. BURCH (1960) records this species as occurring in the eastern Pacific at Panama Bay. P, r, 2, 3. Common on exposed rocky shelves covered with *Hypnea* and *Acanthophora.*

TURRIDAE

Crassispira SWAINSON, 1840

Crassispira fuscescens (REEVE, 1843). Range: Florida Keys to the Caribbean. P, r, 5. Common in shady, protected areas.

Leptadrillia WOODRING, 1928

Leptadrillia splendida BARTSCH, 1934. Range: Caribbean. P, beach drift. Uncommon.

Mangelia RISSO, 1826

Mangelia fusca (C. B. ADAMS, 1845). Range: Caribbean. P, t. Common under rocks, on *Thalassia* leaves, and in beach drift.

Pyrgocythara WOODRING, 1928

Pyrgocythara coxi FARGO, 1953. (?) Range: Florida, the greater Antilles and Central America. P, beach drift. Uncommon.

ONCHIDIIDAE

Onchidella GRAY, 1850

Onchidella sp. P, r, 1, 2. Abundant on damp rocks.

ACTEONIDAE

Acteon MONTFORT, 1810

Acteon finlayi MCGINTY, 1955. Range: southeast Florida and Cuba to Central America. P, beach drift. Rare.

BULLIDAE

Bulla LINNAEUS, 1758

Bulla striata BRUGUIÈRE, 1792. Range: west coast of Florida to Texas and the Caribbean. P. Common as beach specimens.

ATYIDAE

Atys MONTFORT, 1810

Atys caribaea (ORBIGNY, 1841). (?) Range: from southeast Florida to the Caribbean. P, r, 5. Found on green algae and rocks in shady, protected areas. Common.

RETUSIDAE

Retusa BROWN, 1827

Retusa candei ORBIGNY, 1841. Range: Caribbean. P, uncommon in beach drift.

Retusa oxytatus BORN, 1885. Range: southeast U. S. and the Caribbean. P, uncommon in beach drift.

ACTEOCINIDAE

Acteocina GRAY, 1847

Acteocina inconspicua OLSSON & MCGINTY, 1958. Range: Central America. P, uncommon in beach drift.

APLYSIIDAE

Aplysia LINNAEUS, 1767

Aplysia brasiliana RANG, 1828. Range: Atlantic Ocean from New Jersey to St. Helena. P, r, 2, 3. Found in intertidal and rock-shelf zones. Common on rocks covered with *Hypnea* and *Acanthophora.*

Aplysia sp. P, t. Animals difficult to detect due to light green color and darker green reticulations. Foot white, lightly mottled with purple. Uncommon.

Aplysia dactylomela RANG (?) 1828. Range: world-wide in warm seas. P, r, 2. Intertidal zone. Common on rocks covered with red algae.

PYRAMIDELLIDAE

Cingulina A. ADAMS, 1860

Cingulina babylonia (C. B. ADAMS, 1845). Range: Bermuda and the Caribbean. P, beach drift. Common.

Miralda A. ADAMS, 1863

Miralda havanensis PILSBRY & AGUAYO, 1933. Range: southern Florida to the Caribbean. P, beach drift. Common.

Miralda abbotti OLSSON & MCGINTY, 1958. Range: Central America. P, beach drift. Uncommon.

Odostomia FLEMING, 1817

Odostomia sp. P, beach drift. Common.

Odostomia sp. P, beach drift. Uncommon.

OXYNOEIDAE

Oxynoe RAFINESQUE, 1819

Oxynoe antillarum MÖRCH, 1863. Range: southeast Florida to the Caribbean. P, t. Animals brilliant green and quite active. Common on *Caulerpa.*

Lobiger KROHN, 1847

Lobiger souverbii FISCHER, 1856. Range: southeast Florida, the Caribbean to Brazil. P, t. Uncommon on *Caulerpa* with *Oxynoe.*

ELLOBIIDAE

Pedipes MÜHLFELD, 1818

Pedipes mirabilis MÜHLFELD, 1818. Range: Florida to the Caribbean. P, r, 1. Common under damp rocks and rotting vegetation in colonies.

Tralia GRAY, 1840

Tralia ovula (BRUGUIÈRE, 1789). Range: Bermuda, Florida, West Indies and the Caribbean coast of Central America. P, r, 1. Common under damp rocks and rotting seaweed.

Melampus MONTFORT, 1810

Melampus coffeus (LINNAEUS, 1758). Range: Florida to the West Indies and Caribbean coast of Central America. P, r, 1. Abundant under rocks and debris, feeding on rotting vegetation.

PELECYPODA

ARCIDAE

Arca LINNAEUS, 1758

Arca imbricata BRUGUIÈRE, 1789. Range: North Carolina to the Caribbean. P, beach drift. Common.

Barbatia GRAY, 1847

Barbatia domingensis (LAMARCK, 1819). Range: southeast U. S., the Lesser Antilles and Central America. P, r, 2. Common in large groups under coral and rocks.

Arcopsis VON KOENEN, 1885

Arcopsis adamsi (E. A. SMITH, 1888). Range: North Carolina, the Caribbean to Brazil. P, r, 2, t. Abundant under rocks, in large groups.

Anadara DESHAYES, 1830

Anadara ovalis (BRUGUIÈRE, 1789). Range: Cape Cod to the Gulf States and the Caribbean. P, beach specimens. Uncommon.

ISOGNOMONIDAE

Isognomon LIGHTFOOT, 1786

Isognomon alatus (GMELIN, 1791). Range: southern Florida to the Caribbean. P, r, 2. Found in large clusters attached in sheltered crevices on rocks. Common.

Isognomon radiatus ANTON, 1839. Range: southeast Florida to the Caribbean. P, r, 2. Attached in fissures on rocks and usually closer to shore than *I. alatus.* Common.

PTERIIDAE

Pteria SCOPOLI, 1777

Pteria colymbus RÖDING, 1798. Range: southeast U. S. to the Caribbean. P, r, 2. Uncommon. Attached to rocks in sheltered areas. Found only in March.

Spondylidae

Spondylus Linnaeus, 1758

Spondylus americanus Hermann, 1781. Range: Florida and the Caribbean. P, beach specimens.

Limidae

Lima Bruguière, 1797

Lima scabra (Born, 1778). Range: southeast Florida and the Caribbean. P, beach specimens.

Crassatellidae

Crassinella Guppy, 1874

Crassinella martinicensis (Orbigny, 1842). Range: Caribbean. P, beach drift. Common.

Crassinella guadalupensis (Orbigny, 1842). Range: Caribbean. P, beach drift. Common.

Condylocardiidae

Condylocardia Bernard, 1896

Condylocardia bernardi (Dall, 1903). Range: Caribbean. P, beach drift. Common.

Dreissenidae

Mytilopsis Conrad, 1857

Mytilopsis domingensis (Rêcluz, 1852). Range: Caribbean. P, m. Found near fresh water creek attached to stones. Common.

Diplodontidae

Diplodonta Bronn, 1831

Diplodonta notata Dall & Simpson, 1901. Range: Florida to the Greater Antilles and Central America. P, beach drift. Uncommon.

Lucinidae

Phacoides Gray, 1847

Phacoides pectinatus (Gmelin, 1791). Range: southeast U. S., Texas and the Caribbean. P, t. Common in sand under *Thalassia.*

Anodontia Link, 1807

Anodontia alba Link, 1807. Range: southeast U. S. and the Caribbean. P, t. Uncommon. *Anodontia edentuloides* is the Panamic analogue.

Codakia Scopoli, 1777

Codakia orbicularis (Linnaeus, 1758). Range: Florida to Texas and the Caribbean. P, t. Common in sand under *Thalassia* beds. *Codakia distinguenda* is a closely related species in the Pacific.

Codakia orbiculata (Montagu, 1808). Range: southeast U. S. and the Caribbean. P, t. Uncommon, dead valves.

Codakia costata Orbigny, 1842. Range: southeast U. S. and the Caribbean. P, uncommon in beach drift.

Chamidae

Chama Linnaeus, 1758

Chama macerophylla Gmelin, 1791. Range: southeast U. S. and the Caribbean. P, r, 2, 3. Common attached to rocks in protected places.

Chama congregata Conrad, 1833. Range: southeast U. S. and the Caribbean. P, t. Common as dead valves in beach drift.

Veneridae

Chione Mühlfeld, 1811

Chione cancellata (Linnaeus, 1767). Range: southeast U. S. to Texas and the Caribbean. P, t. Only immature specimens taken in sand under *Thalassia.* Rare.

Tivela Link, 1807

Tivela mactroides (Born, 1778). Range: Caribbean south to Brazil. P; B. Common as single valves on beaches. The Panamic analogue is *T. byronensis* (Gray, 1838).

Pitar Römer, 1857

Pitar dione (Linnaeus, 1758). Range: Texas and the Caribbean. B, common as beach specimens. *Pitar lupanaria* (Lesson, 1830) is a closely related species in the Pacific.

Tellinidae

Tellina Linnaeus, 1758

Tellina alternata Say, 1822. Range: southeast U. S., the Gulf of Mexico and the Caribbean. B, on the beach with soft parts. Shell completely pink. Uncommon.

Tellina lineata Turton, 1819. (?) Range: Florida and the Caribbean. P, t. Uncommon.
Tellina sp. P, beach drift.

Arcopagia Brown, 1827

Arcopagia fausta (Pulteney, 1799). Range: southeast U. S. and the Caribbean. P, t.

Strigilla Turton, 1822

Strigilla carnaria (Linnaeus, 1758). Range: southeast U. S. and the Caribbean. B, beach specimens. Abundant.

SEMELIDAE

Semele SCHUMACHER, 1817

Semele purpurascens (GMELIN, 1791). Range: southeast U. S. and the Caribbean. P, beach specimens. Uncommon.

Semele nuculoides (CONRAD, 1841). Range: southeast U. S. and the Caribbean. P, beach specimens. Uncommon.

DONACIDAE

Donax LINNAEUS, 1758

Donax denticulatus LINNAEUS, 1758. Range: Caribbean. B. Some specimens unusually large. Common, burrowing at the edge of the surf.

Iphigenia SCHUMACHER, 1817

Iphigenia brasiliensis (LAMARCK, 1818). Range: southern Florida and the Caribbean. P, beach specimens. Uncommon. FLUCK (1905) found it plentiful in Nicaragua. The Panamic analogue is *I. altior* (SOWERBY, 1833).

MACTRIDAE

Mactra LINNAEUS, 1767

Mactra alata SPENGLER, 1802. Range: Caribbean to Brazil. Also occurs in the Pacific. P; B, beach specimens. Abundant. This species is eaten by the natives.

Mulinia GRAY, 1837

Mulinia cleryana ORBIGNY, 1846. Range: Caribbean to Brazil. B, beach specimens. Common.

CORBULIDAE

Corbula BRUGUIÈRE, 1792

Corbula sp. P, beach drift. Uncommon.

PHOLADIDAE

Martesia BLAINVILLE, 1824

Martesia striata (LINNAEUS, 1767). Range: west Florida to Texas and the Caribbean. Also occurs in the Pacific. P, in driftwood.

Pholas LINNAEUS, 1758

Pholas campechiensis GMELIN, 1791. Range: North Carolina to Brazil, Caribbean, Senegal to Liberia. B, beach specimens. Common. This species is the analogue of *P. chiloensis* MOLINA, 1782 of the Pacific.

PERIPLOMATIDAE

Periploma SCHUMACHER, 1817

Periploma inaequivalvis SCHUMACHER, 1817. Range: Caribbean. B, beach specimens. Uncommon.

AMPHINEURA

CRYPTOPLACIDEA

Acanthochitona GRAY, 1821

Acanthochitona rhodeus PILSBRY, 1893. Range: Caribbean. P, r, 2. Uncommon under rocks and in dark places.

Acanthochitona sp. P, r, 2. Rare under rocks.

ISCHNOCHITONIDAE

Ischnochiton GRAY, 1847

Ischnochiton pectinatus (SOWERBY, 1849). Range: Caribbean. P, r, 2. Common under rocks and in dark places.

Ischnochiton sp. P, r, 2. Rare under rocks.

Callistochiton DALL, 1882.

Callistochiton sp. P, r, 2. Rare under rocks.

CHITONIDAE

Chiton LINNAEUS, 1758

Chiton tuberculatus LINNAEUS, 1758. Range: Caribbean. P, r, 2. Common in groups under wet rocks. Glides quickly away from light when disturbed.

Chiton marmoratus GMELIN, 1791. Range: Caribbean. P, r, 2. Uncommon. This species is quite active and shows a negative phototropic reaction.

Acanthopleura GUILDING, 1829

Acanthopleura granulata (GMELIN, 1791). Range: southern Florida and the Caribbean. P, r, 1, 2. The most abundant chiton and seen everywhere in groups.

SCAPHOPODA

SIPHONODENTALIIDAE

Cadulus PHILIPPI, 1844

Cadulus sp. P, beach drift.

DENTALIIDAE

Dentalium LINNAEUS, 1758

Dentalium sp. P, beach drift.

Dentalium sp. P, beach drift.

CEPHALOPODA

SPIRULIDAE

Spirula LAMARCK, 1799

Spirula spirula (LINNAEUS, 1758). Range: worldwide. B, beach specimens.

OCTOPODIDAE

Octopus LAMARCK, 1798

Octopus vulgaris LAMARCK, 1798. Range: Connecticut to Florida, the Caribbean and Europe. P, t, r, 2, 3, 4. Common.

LITERATURE CITED

ABBOTT, ROBERT TUCKER

1944. The genus *Modulus* in the western Atlantic. Johnsonia 1 (14): 1-6

1950. The genera *Xancus* and *Vasum* in the western Atlantic. Johnsonia 2 (28): 201-219; plts. 89-95

1954. American seashells. Princeton, New Jersey. D. van Nostrand Co., Inc.; xiv + 541 pp.; 100 figs.; 40 plts.

1954. Review of the Atlantic periwinkles, *Nodilittorina, Echininus,* and *Tectarius.* Proc. U. S. Nat. Mus. **103** (3228): 449-464; figs. 55-57

1958. The marine mollusks of Grand Cayman Island, British West Indies. Monogr. Acad. Nat. Sci. Philadelphia **11:** 1-138; figs. 1-7; plts. 1-5

1962. Sea shells of the World. Golden Press, New York. 160 pp.; illus.

1964. *Littorina ziczac* (GMELIN) and *L. lineolata* ORBIGNY. Nautilus **78** (2): 65-66

ADAMS, CHARLES BAKER

1852. Catalogue of shells collected at Panama, with notes on synonymy, station, and habitat. Ann. Lyceum Nat. Hist. New York **5:** 229-344 (June); 345-548 (July)

ARNOW, L., F. ST. CLAIR & T. ARNOW

1963. The Mollusca of a lagoonal area at Playa de Vega Baja, Puerto Rico. Carib. Journ. Sci. **3** (2, 3): 163-172

BAKER, FRANK COLLINS

1891. Notes on a collection of shells from southern Mexico. Proc. Acad. Nat. Sci. Philadelphia **43:** 45-55

BARTSCH, PAUL

1946. A new genus and species of minute marine stiliferid mollusks from Florida. Journ. Wash. Acad. Sci. **36** (1): 440; 1 fig.

BAKUS, GERALD J.

1968. Zonation in marine gastropods of Costa Rica and species diversity. The Veliger 10 (3): 207-211 (1 Jan. 1968)

BEQUAERT, JOSEPH CHARLES

1942. *Cerithidea* and *Batillaria* in the western Atlantic. Johnsonia 1 (4): 1-12

1943. The genus *Littorina* in the western Atlantic. Johnsonia **1** (7): 1-27; 7 plts.

BOSS, KENNETH JAY

1966. The subfamily Tellininae in the western Atlantic. The genus *Tellina* (part 1). Johnsonia 4 (45): 217-272; plts. 127-142

BURCH, JOHN QUINCY

1960. *Conus mus* BRUGUIÈRE. Nautilus **74** (2): 81-82

BUSCH, KATHERINE JEANNETTE

1899. Descriptions of new species of *Turbonilla* of the western Atlantic fauna. Proc. Acad. Nat. Sci. Philadelph., Part **1:** 145-177; plt. 8

CARR, ARCHIE

1956. The windward road. Alfred A. Knopf, Inc. New York; 258 pp.; 17 figs.; 3 maps

CLENCH, WILLIAM JAMES

1942. The genus *Conus* in the western Atlantic. Johnsonia **1** (6): 1-40; 15 plts.

1947. The genera *Purpura* and *Thais* in the western Atlantic. Johnsonia 2 (23): 61-91; plts. 32-40

1964. The genera *Pedipes* and *Laemodonta* in the western Atlantic. Johnsonia 4 (42): 117-127; plts. 76-79

CLENCH, WILLIAM JAMES & ROBERT TUCKER ABBOTT

1941. The genus *Strombus* in the western Atlantic. Johnsonia **1** (1): 1-15

1942. The genera *Tectarius* and *Echininus* in the western Atlantic. Johnsonia 1 (4): 1-4

1943. The genera *Cypraecassis, Morum, Sconsia,* and *Dolium* in the Western Atlantic. Johnsonia **1** (9): 8 pp.; 4 plts.

1943. The genera *Gaza* and *Livona* in the western Atlantic. Johnsonia 1 (12): 1-9

CLENCH, WILLIAM JAMES & L. C. SMITH

1944. The family Cardiidae in the western Atlantic. Johnsonia 1 (13): 1-32

CLENCH, WILLIAM JAMES & RUTH DIXON TURNER

1950. The western Atlantic marine mollusks described by C. B. ADAMS. Occas. Pap. on mollusks **1** (15): 233-404; plts. 29-49

1956. The genus *Truncatella* in the western Atlantic. Johnsonia 2 (25): 149-164; plts. 65-73

1956. The genus *Epitonium* in the western Atlantic. Johnsonia 2 (30): 249-288; plts. 108-130

1956. The genera *Epitonium* (part II), *Depressiscala, Cylindriscala, Nystiella,* and *Solutiscala* in the western Atlantic. Johnsonia 2 (31): 289-356; plts. 131-177

1957. The family Cymatiidae in the western Atlantic. Johnsonia 3 (36): 189-244 plts. 110-135

COOMANS, H. E.

1958. A survey of the littoral gastropoda of the Netherlands Antilles and other Caribbean islands. Stud. Fauna Curaçao **8** (31): 42-111

DALL, WILLIAM HEALEY

1886. Reports on the results of dredging, . . in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U. S. Coast Survey Steamer "Blake", . . . Report on the Mollusca, pt. 1, Brachiopoda and Pelecypoda. Bull. Mus. Comp. Zool. 12: 171-318

1889. Reports on the results of dredging, . . . in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U. S. Coast Survey Steamer "Blake", . . . Report on the Mollusca, pt. 2, Gastropoda and Scaphopoda. Bull. Mus. Comp. Zool. 18 (2): 1-492; plts. 1-40

DALL, WILLIAM HEALEY & CHARLES TORREY SIMPSON

1901. The Mollusca of Porto Rico. U. S. Fish Comm. Bull. 20: 351-516; plts. 53-58

EALES, NELLIE B.

1960. Revision of the world species of *Aplysia* (Gastropoda, Opisthobranchia). Bull. Brit. Mus. (Nat. Hist.) Zool. 5 (10): 267-404; 51 text figs.

Farfante, Isabel Pérez

1943. The genera *Fissurella, Lucapina,* and *Lucapinella* in the Western Atlantic. Johnsonia **1** (10): 1 - 20; plts. 1 - 5 (7 August 1943)

1943. The genus *Diodora* in the western Atlantic. Johnsonia 1 (11): 1 - 20

Fischer, Paul

1857. Études sur un groupe de coquilles de la famille des Trochidae (Fin). 8. Journ. de Conchyliol. **6**: 284 - 288

Fluck, William Henry

1900: Shell collecting on the mosquito coast. Nautilus 14 (8): 94

1901. Correspondence [from Nicaragua] Nautilus 15 (4): 48

1905. Shell collecting on the mosquito coast. Nautilus 19 (1): 8 - 12; 19 (2): 16 - 19; 19 (3): 32 - 34; 19(5): 55 - 57 19 (7): 78 - 80; 1906 - 20 (1): 1 - 4

Gabb, William More

1881. Descriptions of Caribbean Miocene fossils. Acad. Nat. Sci. Philadelphia Journ. (2) **8**: 337 - 348

Garcia-Cubas, A.

1963. Systematica y distribucion de los micromoluscos recientes de la Laguna de Terminos, Campeche, Mexico. Boll. Inst. Geol. Mex. **67** (4): 1 - 55

Holle, Paul August & Clarence F. Dineen

1959. Studies on the genus *Melampus* (Pulmonata). Nautilus **73** (1): 28 - 38; plts. 5, 6; (2): 46 - 51

Jaume, Miguel L.

1946. Moluscos marinos litorales del Cabo Catoche, Yucatan, Mexico. Rev. Soc. Malac. **4**: 95 - 110

Johnson, Charles W.

1934. List of marine mollusca of the Atlantic coast from Labrador to Texas. Proc. Boston Soc. Nat. Hist., **40**: 1 - 204

Keen, A. Myra

1958. Sea shells of tropical West America; marine mollusks from Lower California to Colombia. i - xi + 624 pp.; illus. Stanford Univ. Press, Stanford, Calif. (5 December 1958)

Kelso, Donald P.

1965. A contribution to the ecology of a tropical estuary. Master's thesis, Univ. Florida, Gainesville, Florida

Krebs, H. J.

1864. The West Indian marine shells with some remarks. Rev. Soc. Malac. **5**: 6

Lewis, J. B.

1960. The fauna of rocky shores of Barbados, West Indies. Canad. Journ. Zool. **38**: 391 - 435

Marcus, Ernst

1957. On opisthobranchia from Brazil. Journ. Linn. Soc. London (Zoology) **43** (292): 46 - 51

1958. On western Atlantic opisthobranch gastropods. Am. Mus. Novitates no. 1906; pp. 1 - 82; figs. 1 - 111

McGinty, Thomas Ladue

1955. New marine mollusks from Florida. Proc. Acad. Nat. Sci. Philadelphia **107**: 75 - 85; 2 plts.

1962. Caribbean marine shells. Nautilus **76** (2): 39 - 44; plt. 3

McLean, Richard Alfred

1941. The oysters of the western Atlantic. Notula Natur. no. 76: 1 - 14; 4 plts.

1951. Scientific survey of Porto Rico and the Virgin Islands. The pelecypoda or bivalve mollusks of Porto Rico and the Virgin Islands. New York Acad. Sci. **17** (1): 1 - 183; 26 plts.

Moore, Donald R.

1964. The family Vitrinellidae in South Florida and the Gulf of Mexico. Ph. D. dissert., Univ. Miami, Coral Gables, Florida.

Olsson, Axel Adolf

1922. The Miocene of northern Costa Rica. Bull. Amer. Paleontol. 9 (39): 1 - 311

1956. Studies on the genus *Olivella.* Proc. Acad. Nat. Sci. Philadelphia **108**: 155 - 225; plts. 8 - 16

1961. Mollusks of the tropical eastern Pacific particularly from the southern half of the Panamic-Pacific faunal province (Panama to Peru). Panamic-Pacific Pelecypoda. Paleont. Res. Instit. Ithaca, N. Y.: 574 pp.; 86 plts. (10 March 1961)

Olsson, Axel Adolf & Thomas L. McGinty

1958. Recent marine mollusks from the Caribbean coast of Panama with the descriptions of some new genera and species. Bull. Amer. Paleo. 39 (177): 1 - 58; plts. 1 - 5; 5 figs. (10 December 1958)

Olsson, Axel A. & Richard E. Petit

1964. Some Neogene Mollusca from Florida and the Carolinas. Bull. Amer. Paleont. **47** (217): 507 - 574; plts. 77 to 83

Parker, Robert H.

1963. Zoogeography and ecology of some macro-invertebrates, particularly mollusks, in the Gulf of California and the continental slope off Mexico. Vidensk. Medd. Dansk Naturhist. For., 126: 1 - 178; plts. 1 - 15

Perry, Louise M. & Jeanne Sanderson Schwengel

1955. Marine shells of the western coast of Florida. Bull. Amer. Paleontol. 26 (95): 1 - 318; 40 plts.

Pilsbry, Henry Augustus

1946. The type specimens of C. B Adam's Jamaican species of *Vitrinella.* Notula Nat., Acad. Nat. Sci. Philadelphia no. 162: 1 - 5; 1 plt.

Rehder, Harald Alfred

1943. New marine mollusks from the Antillean region. Proc. U. S. Nat. Mus. 93 (3161): 187 - 203

1962. Contribucion al conocimiento de los moluscos marinos del archipielago de los Roques y la Orchila. Mem. Soc. Cienc. Natur. la Salle 22 (62): 116 - 138

Rice, W. H. & L. S. Kornicker

1962. Mollusks of Alacran Reef, Campeche Bank, Mexico. Publ. Marine Sci. Univ. Texas **8**: 366 - 403; 9 plts.

1965. Mollusks from the deeper waters of the northwestern Campeche Bank, Mexico. Publ. Instit. Marine Sci. (Port Aransas), Texas **10**: 108 - 172; 16 plts.

Robertson, Robert

1958. The family Phasianellidae in the western Atlantic. Johnsonia 3 (37): 245 - 283; 3 (39): 344 - 346; plts. 136 - 148

Rodriguez, G.

1959. The marine communities of Margarita Island, Venezuela. Bul. Mar. Sci. Gulf and Carib. 9: 237 - 280; 26 figs.

Russell, Henry Drummond

1941. The Recent mollusks of the family Neritidae of the western Atlantic. Bull. Mus. Comp. Zool. **88**: 343 - 404

Schuchert, D. R.

1935. Historical geology of the Antillean - Caribbean region, or the lands bordering the Gulf of Mexico and the Caribbean Sea. John Wiley & Sons, New York; xxvi + 811 pp.; 107 figs.; 16 plts.

Stoddart, D. R.

1962. Three Caribbean atolls: Turneffe Islands, Lighthouse Reef, and Glover's Reef, British Honduras. Atoll. Res. Bull. 87: 1 - 149

de la Torre, Alfredo

1960. Caribbean species of *Truncatella*. Nautilus **73** (3): 79 - 88

Tryon, George Washington & Henry Augustus Pilsbry

1895 - 1896. Manual of conchology **16**. Philadelphia

Turner, Ruth Dixon

1954. The family Pholadidae in the Western Atlantic and Eastern Pacific. Part I – Pholadinae.. Johnsonia **3** (33): 1 - 63; plts. 1 - 34

Usticke, G. W. Nowell

1959. A check list of the marine shells of St. Croix, U. S. Virgin Islands, with random annotations. Privately printed; 90 pp.; 4 plts.

Warmke, Germaine L. & Robert Tucker Abbott

1961. Caribbean seashells; a guide to the marine mollusks of Puerto Rico and other West Indian islands, Bermuda and the lower Florida Keys. x + 346 pp.; 44 plts.; 34 text figs.

Weisbord, Norman Edward

1926. Notes on marine mollusks from the Yucatan Peninsula, Mexico. Nautilus 39 (3): 81 - 87

1962. Late Cenozoic gastropods from Northern Venezuela. Bull. Amer. Paleo. **42** (193): 1 - 672; plts. 1 - 48 (5 March 1962)

1964. Late Cenozoic pelecypods from northern Venezuela. Bull. Amer. Paleo. 45 (204): 1 - 523

Woodring, Wendell Phillips

1928. Miocene mollusks from Bowden, Jamaica: Part II: Gastropods and discussion of results. Carnegie Inst. Washington, publ. no. 385. pp. i - vii + 1 - 564; plts. 1 - 40; 3 text figs. (28 November 1928) [p. 224; plt. 13, fig. 2]

1957. Geology and paleontology of the Canal Zone and adjoining parts of Panama. U. S. Geol. Surv. Prof. Paper 306 - a, **b**, **c**: 1 - 297; 47 plts.

1965. Endemism in Middle Miocene Caribbean molluscan faunas. Science 148 (3672): 961 - 963; 1 fig.

Woodward, S. P.

1875. A manual of the Mollusca. Lockwood & Co., London; 486 pp.; 272 figs.; 24 plts.; 1 map